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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/640,928 | 08/17/2000 | Morimichi Nishigaki | OAC-004 | 3276 |

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LAHIVE & COCKFIELD
28 STATE STREET
BOSTON, MA 02109

EXAMINER

PATEL, SHEFALI D

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2621

DATE MAILED: 06/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/640,928

Applicant(s)

NISHIGAKI ET AL.

Examiner

Shefali d Patel

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 August 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 August 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: reference element " a_{11} " on page 8 lines 18 and 20 is not shown in any of the figures. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description:
 - a. Figure 4A, element "S3" and Figure 5A element "S3" are not disclosed in the specification.
 - b. Element "h" in figure 4A is disclosed in Equation 3 on page 14. All of the elements in Equation 3 are defined on page 15 except for "h." Please give a definition of element "h."

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claim 9 recites the limitation "the content" in line 20 on page 22. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1, 11-13 and 15-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Yamaguchi et al. ("Yamaguchi") USPN 6,487,303.

With regards to **claim 1**, which is representative of **claims 11 and 15**, Yamaguchi discloses an object recognition system mounted on a vehicle, comprising: one or more sensors

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for capturing an image of an object (column 5 lines 62-63); measuring means for dividing the image into a plurality of windows and measuring a distance to the road surface for each of a plurality of windows (column 6 lines 1-6, here the image is divided in plurality of windows 52 as seen in Figs. 3(a) and 3(b) and distance is measured to the road surface for each window as shown in the distance image 30); estimating a relative inclination of the road surface against the vehicle based on the distances (column 7 lines 50-57); judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle or the road surface; and recognizing the object based on the judgment result (column 8 lines 13-19).

With regards to **claim 12**, which is representative of **claim 16**, Yamaguchi discloses extracting windows having captured the road surface from the plurality of windows, and wherein the step of inclination estimation estimates the inclination utilizing distances of the plurality of distances, the utilized distances corresponding to the extracted windows. The distance is obtained at column 8 lines 20-24 and the windows capturing the road surface are shown in Figs. 3(a) and 3(b).

With regards to **claim 13**, Yamaguchi discloses estimating distances to the road surface respectively for the plurality of windows based on the estimated inclination at, wherein windows are extracted based on the estimated distances in the step of extraction at column 6 lines 1-8.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-10, 14, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi in combination with Shimoura et al. ("Shimoura") USPN 5,638,116.

With regards to **claim 2**, Yamaguchi discloses a system where inclination is estimated. However, Yamaguchi does not expressly disclose inclination estimation comprising: pitch estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels. Shimoura discloses object recognition apparatus and a method in which Shimoura teaches estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels at column 27 lines 34-48. One of ordinary skill in the art would have been motivated to estimate the inclination of the road surface comprising estimating slope of pitching/roll of the vehicle in order to obtain high efficiency recognition of the object, especially, (as suggested by Shimoura) since the object moves in an image from moment to moment, it requires accurate camera/sensor attitude parameters (i.e., pitch angle and roll angle) representing the attitude of the camera/sensor with respect to the road surface.

With regard to **claim 3**, Yamaguchi discloses estimating means for estimating the distance as described in claim 1 above. Yamaguchi does not expressly disclose a distance memory for storing each of the distance estimated. Shimoura discloses a memory 17 as discloses in Fig. 1. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have the memory unit for storage purpose and using the storage data for later use.

With regards to **claim 4**, Yamaguchi discloses judging means that compares for each window the distance measured by said measuring means and the estimated distance estimated by said distance estimating means to determine relative to each window whether the window represents the road surface at column 4 lines 61-67.

Regarding **claim 5**, Yamaguchi discloses judging means which extracts windows that represent object other than the road surface for transfer to said recognition means at column 8 lines 17-20. Yamaguchi identifies whether the object is a road surface or another object.

With regard to **claims 6 and 7**, Yamaguchi discloses inclination estimation means. However, Yamaguchi does not expressly disclose pitch/roll estimating means. Shimoura discloses pitch estimating means that determines pitch angle θ and roll angle α at column 27 lines 38 and 44, respectively.

Shimoura does not clearly disclose the pitch/roll angle according to the equation;

$$\tan \theta = \frac{n \sum Z_i Y_i - \sum Z_i \sum Y_i}{n \sum Z_i^2 - (\sum Z_i)^2}$$

and roll angle α according to the equation;

$$\tan \alpha = \frac{n \sum X_i Y_i - \sum X_i \sum Y_i}{n \sum X_i^2 - (\sum X_i)^2}$$

where X_i , Y_i and Z_i are x-axis, y-axis and z-axis positions respectively of i-th sample and n indicates the number of samples, x-axis being the direction of breather of the vehicle, y-axis being the direction of height of the vehicle and z-axis being the direction of travel of the vehicle.

It would have been obvious matter of design choice to modify Shimoura's reference by having different parameters representing the x, y, and z-axis to obtain the angle. Shimoura discloses the x, y and z-axis at column 26 lines 20-48. It appears that the angles are obtained in the same manner with a different form, however they both have the same functionality to obtain the pitch/roll angle.

With regards to **claim 8**, the recited features are the same as those in claim 1, and the arguments in paragraph 2 above as to the relevance of Yamaguchi are incorporated herein. An additional feature of correcting positioning error of said one or more sensors based on an average of the estimated inclination is discloses by Shimoura at column 26 lines 43-48. One of ordinary skill in the art would have been motivated to correct the occurred position error to eliminate problems so that the system can take images properly.

With regards to **claim 9**, the recited features are the same as those in claim 2-3 and 9, and the arguments in paragraph 4 above as to the relevance of Yamaguchi and Shimoura are incorporated herein.

With regards to **claim 10**, Shimoura discloses the pitch/roll estimating means as explained above in claim 2. Further, Shimoura discloses sensor position estimating means for estimating deviation of the position of said one or more sensors from their specified position based on the pitch estimated by said pitch estimating means and the roll estimated by said roll estimating means; wherein the deviation of the position of said one or more sensors is

determined based on moving average of the estimated pitch and the estimated roll at column 28 lines 30-35 and lines 37-42.

With regards to **claim 14**, which is representative of **claim 18**, Shimoura discloses the recognition step further obtaining, when the object has been judged as an obstacle in the judging step, a relative speed and a relative distance between the vehicle and the obstacle utilizing the image at column 35 lines 42-48, and further comprising steps of: sensing possible collision with the obstacle based on at least one of the relative speed and the relative distance; and performing collision avoidance action at column 35 lines 56-64.

With regards to **claim 17**, the recited features are the same as those in claims 1 and 3, and the arguments in paragraphs 2 and 4 above as to the relevance of Yamaguchi and Shimoura are incorporated herein. Note: Shimoura discloses a memory 17 as discloses in Fig. 1.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USPN 5214408 – object sensed by sensors, display having a plurality of windows of object recognized. See column 4 and column 6 lines 58-63.

USPN 4722547 -- two or more ultra-sonic sensors obtaining a pitch and roll of the vehicle.

USPN 5359666 – a device for judging the contour of the road by determining the inclination column 6 lines 18-20, and column 9 lines 31-48.

JP 08-210848 – distance measuring by dividing the image into plurality of windows. See paragraphs 0028-0031.

Weber et al., “An integrated stereo-based approach to automatic vehicle guidance” 1995, IEEE, 1-36.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali d Patel whose telephone number is 703-306-4182. The examiner can normally be reached on M-F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on 703-305-4706. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

Shefali Patel
May 21, 2003



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